

WHAT IS CLAIMED IS:

1. A method of making a diamond product by etching, said method comprising the steps of:

forming a diamond substrate with a mask layer; and

5 etching said diamond substrate formed with said mask layer with a plasma of a mixed gas composed of a gas containing an oxygen atom and a gas containing a fluorine atom;

wherein said fluorine atom has a concentration within the range of 0.04% to 6% with respect to the total number of atoms in said mixed gas.

2. A method of making a diamond product according to claim 1, wherein said plasma is produced by generating a high-frequency discharge between two plate electrodes arranged in parallel; and

15 wherein said high-frequency discharge is generated by supplying an electric power of at least 0.45 W/cm<sup>2</sup> between said plate electrodes.

3. A method of making a diamond product according to claim 1, wherein said gas containing said fluorine atom is CF<sub>4</sub> gas; and

20 wherein said CF<sub>4</sub> gas has a concentration within the range of 0.02% to 3% with respect to the total number of molecules in said mixed gas.

4. A method of making a diamond product according to claim 1, wherein said gas containing said oxygen atom is one of O<sub>2</sub>, CO<sub>2</sub>, and a mixed gas composed of O<sub>2</sub> and CO<sub>2</sub>.

5. A diamond product comprising:

a diamond substrate;

a plurality of aligned protrusions made of diamond,  
formed on said diamond substrate by etching, and arranged  
according to a predetermined rule; and

a plurality of subsidiary protrusions randomly formed  
between said plurality of aligned protrusions upon etching;

wherein said aligned protrusions have a side face with  
an angle of inclination of at least  $78^\circ$ ; and

wherein said subsidiary protrusions have a top part  
which is not flat, the number of said subsidiary protrusions  
being not greater than 20 per  $25\ \mu\text{m}^2$ .

6. A diamond product comprising:

a diamond substrate having a recess formed by etching;

and

a plurality of subsidiary protrusions randomly formed  
at a bottom part of said recess upon etching;

wherein said recess has a side face with an angle of  
inclination of at least  $78^\circ$ ; and

wherein said subsidiary protrusions have a top part  
which is not flat, the number of said subsidiary protrusions  
being not greater than 20 per  $25\ \mu\text{m}^2$ .

7. A diamond product comprising:

a diamond substrate;

one protrusion made of diamond and formed on said  
diamond substrate by etching; and

a plurality of subsidiary protrusions randomly formed about said one protrusion upon etching;

wherein said one protrusion has a side face with an angle of inclination of at least  $78^\circ$ ; and

5            wherein said subsidiary protrusions having a top part which is not flat, the number of said subsidiary protrusions being not greater than 20 per  $25 \mu\text{m}^2$ .

8.        A method of making a diamond product by etching, said method comprising the steps of:

10           forming a diamond substrate with a mask layer; and  
             etching said diamond substrate formed with said mask layer with a plasma of a mixed gas composed of a gas containing an oxygen atom and a gas containing a halogen atom;

             wherein, in an emission spectrum of said mixed gas,  
15           an intensity A of an emission peak caused by said oxygen atom and an intensity B of an emission peak caused by oxygen have an intensity ratio A/B which is greater than the intensity ratio A/B obtained from an emission of a plasma which is 100% oxygen.

20           9.        A method of making a diamond product according to claim 8, wherein said gas containing said halogen atom is  $\text{CF}_4$ , and wherein said mixed gas further contains nitrogen gas.

25           10.       A method of making a diamond product according to claim 8, wherein said emission peak caused by said oxygen atom has a half width of 3 nm or less, and wherein said emission

peak caused by oxygen has a half width greater than 3 nm.